

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE THE

APPLICATION OF: Joseph C. Barrett

ART UNIT: Not Yet Assigned

APPLICATION NO.: Not Yet Assigned

EXAMINER: Not Yet Assigned

FILED: Herewith

TITLE: PLASTIC BALL GRID
ARRAY ASSEMBLY

PRELIMINARY AMENDMENT

The Commissioner for Patents
BOX PATENT APPLICATION
Washington, D.C. 20231

Applicant respectfully requests entry of this preliminary amendment prior to calculation of the filing fee and examination of this divisional patent application.

Express Mail mailing label number: EL 485753662 US

Date of Deposit: August 2, 2001

I hereby certify that I am causing this paper or fee to be deposited with the United States Postal Service "Express Mail Post Office to Addressee" service on the date indicated above and that this paper or fee has been addressed to the Commissioner for Patents, Washington, D.C. 20231.

Shenise Ramdeen

(Printed name of person mailing paper or fee)

Shenise Ramdeen

(Signature of person mailing paper or fee)

IN THE SPECIFICATION

On page 2 prior to the paragraph starting on line 2, please insert the following:

This application is a divisional patent application of U.S. Patent Application No. 09/527,284, filed March 17, 2000, now pending, which is a divisional patent application of U.S. Patent Application No. 08/986,275, filed December 5, 1997, now U.S. Patent No. 6,064,117.

On page 4, please replace the paragraph starting on line 14 with the following paragraph:

As a result of this construction, the corner sections 19 of prior PBGA assemblies 10 are susceptible to mechanical damage. The flexible corner sections 19 are easily damaged, for example, during processing associated with the assembly, test, and installation of the PBGA assemblies 10, and during normal handling.

On page 9, please replace the paragraph starting on line 12 with the following paragraph:

Although the solder balls 120 can be located across the entire lower surface of the substrate 114, in accordance with one embodiment of the present invention, the solder balls 120 are spaced from the areas directly beneath the edges of the die 22. Shear stress tends to be the greatest during temperature cycling in the area directly beneath the edges of the die 22, and thus, after a relatively few number of thermal cycles, the solder balls 120 tend to fail. However, beneath the die 22 but spaced from the edges thereof, the solder balls 120 can also serve as a heat transfer path into the printed circuit board. Thus, in one embodiment depicted in Figure 5, about five rows 200 of solder balls 120 are disposed generally around the edges of the substrate 114. Additionally, a plurality of central solder balls 202 are spaced from the peripheral solder balls

200, lying directly below the die 22, but spaced from the edges of the die 22. The central solder balls 202 can be used for transferring electrical signals and/or heat transfer. Alternatively, the central solder balls 202 can be eliminated, leaving only the peripheral solder balls 200.

IN THE CLAIMS

Please cancel claims 1-15 without prejudice or disclaimer, and please add new claims 16-42.

PENDING CLAIMS

16. (New) An apparatus comprising:
 - a substrate;
 - a chip mounted on the substrate; and
 - a mold cap disposed over the substrate such that the mold cap at least partially covers the chip, the mold cap having an extension extending into a corner section of the substrate.
17. (New) The apparatus of claim 16, wherein the extension is a rib structure.
18. (New) The apparatus of claim 16, wherein the extension extends to an edge of the substrate.
19. (New) The apparatus of claim 16, wherein the extension extends into the corner section of the substrate without extending to an edge of the substrate.

20. (New) The apparatus of claim 16, wherein the mold cap has chamfered edges.
21. (New) The apparatus of claim 16, comprising a plurality of solder balls on a surface of the substrate opposite the mold cap.
22. (New) The apparatus of claim 21, comprising a plurality of solder balls on the surface of the substrate in an area directly opposite the chip.
23. (New) The apparatus of claim 21, wherein all solder balls on the surface of the substrate are spaced from areas directly opposite an edge of the chip.
24. (New) An apparatus comprising:
a substrate;
a chip mounted on the substrate; and
a mold cap disposed over the substrate such that the mold cap at least partially covers the chip, the mold cap having a plurality of extensions each extending into a respective corner section of the substrate.
25. (New) The apparatus of claim 24, wherein each extension is a rib structure.
26. (New) The apparatus of claim 24, wherein each extension is a rounded structure.

27. (New) The apparatus of claim 24, wherein each extension is a rounded corner of the mold cap.

28. (New) The apparatus of claim 24, wherein at least one extension extends to an edge of the substrate.

29. (New) The apparatus of claim 24, wherein at least one extension extends into a respective corner section of the substrate without extending to an edge of the substrate.

30. (New) The apparatus of claim 24, wherein the mold cap has chamfered edges.

31. (New) The apparatus of claim 24, comprising a plurality of solder balls on a surface of the substrate opposite the mold cap.

32. (New) The apparatus of claim 31, comprising a plurality of solder balls on the surface of the substrate in an area directly opposite the chip.

33. (New) The apparatus of claim 31, wherein all solder balls on the surface of the substrate are spaced from areas directly opposite an edge of the chip.

34. (New) An apparatus comprising:

a substrate;

a chip mounted on the substrate; and

a mold cap disposed over the substrate such that the mold cap at least partially covers the chip, the mold cap having an extension adjacent a corner section of the substrate.

35. (New) The apparatus of claim 34, wherein the extension is a rib structure.

36. (New) The apparatus of claim 34, wherein the extension is a rounded structure.

37. (New) The apparatus of claim 34, wherein the extension is a rounded corner of the mold cap.

38. (New) The apparatus of claim 34, wherein the mold cap has a plurality of extensions each adjacent a respective corner section of the substrate.

39. (New) The apparatus of claim 34, wherein the mold cap has chamfered edges.

40. (New) The apparatus of claim 34, comprising a plurality of solder balls on a surface of the substrate opposite the mold cap.

41. (New) The apparatus of claim 40, comprising a plurality of solder balls on the surface of the substrate in an area directly opposite the chip.

42. (New) The apparatus of claim 40, wherein all solder balls on the surface of the substrate are spaced from areas directly opposite an edge of the chip.

RECEIVED

[illegible]

Proposed Drawing Correction

Page 8 of 11

MARKED UP VERSION OF AMENDMENTS

IN THE SPECIFICATION

The following paragraph has been added as the first paragraph on page 2:

This application is a divisional patent application of U.S. Patent Application No. 09/527,284, filed March 17, 2000, now pending, which is a divisional patent application of U.S. Patent Application No. 08/986,275, filed December 5, 1997, now U.S. Patent No. 6,064,117.

The paragraph starting on page 4 at line 14 has been amended as follows:

As a result of this construction, the corner sections 19 of prior PBGA assemblies 10 are susceptible to mechanical damage. The flexible corner sections [10] 19 are easily damaged, for example, during processing associated with the assembly, test, and installation of the PBGA assemblies 10, and during normal handling.

The paragraph starting on page 9 at line 12 has been amended as follows:

Although the solder balls [20] 120 can be located across the entire lower surface of the substrate 114, in accordance with one embodiment of the present invention, the solder balls [20] 120 are spaced from the areas directly beneath the edges of the die 22. Shear stress tends to be the greatest during temperature cycling in the area directly beneath the edges of the die 22, and thus, after a relatively few number of thermal cycles, the solder balls [20] 120 tend to fail. However, beneath the die 22 but spaced from the edges thereof, the solder balls [20] 120 can also serve as a heat transfer path into the printed circuit board. Thus, in one embodiment depicted in

Figure 5, about five rows 200 of solder balls [20] 120 are disposed generally around the edges of the substrate 114. Additionally, a plurality of central solder balls 202 are spaced from the peripheral solder balls 200, lying directly below the die 22, but spaced from the edges of the die 22. The central solder balls 202 can be used for transferring electrical signals and/or heat transfer. Alternatively, the central solder balls 202 can be eliminated, leaving only the peripheral solder balls 200.

IN THE CLAIMS

Claims 1-15 have been canceled.

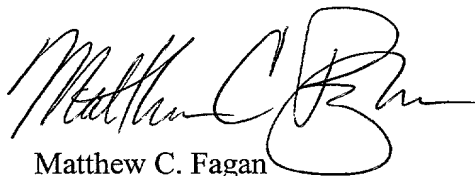
Claims 16-42 have been added.

The Examiner is invited to telephone the undersigned to help expedite any further prosecution of the present application.

The Director of the U.S. Patent and Trademark Office is hereby authorized to credit any overpayment or to charge any fees or fee deficiencies under 37 C.F.R. §§ 1.16 and 1.17 in connection with this communication to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR
& ZAFMAN, L.L.P.



Date: August 2, 2001

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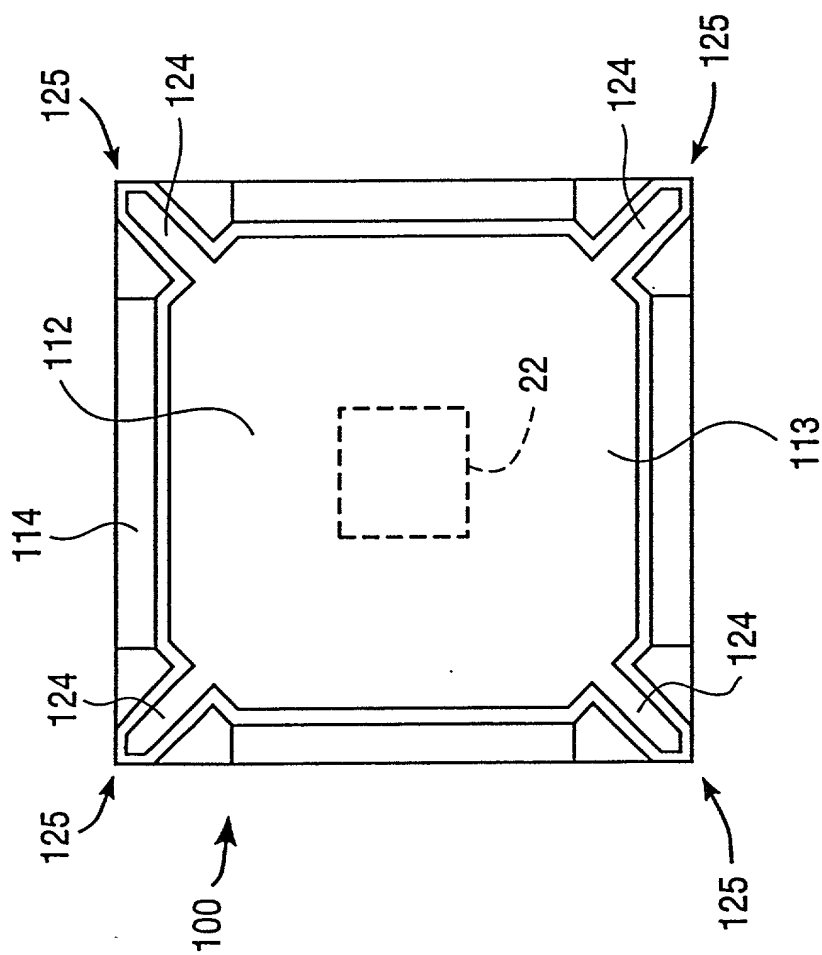


FIG. 2A

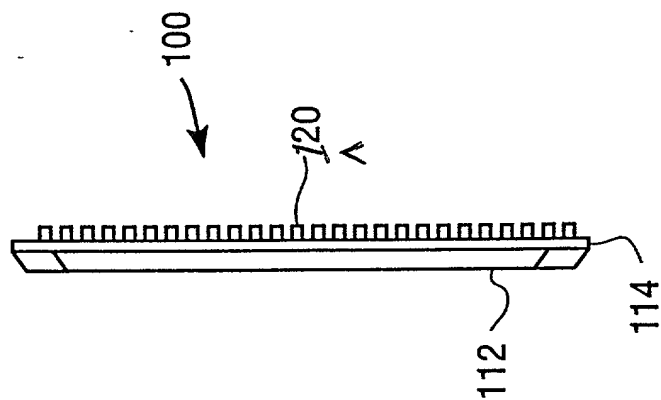


FIG. 2B